

**Virginia Electric and Power Company  
North Anna Power Station  
P. O. Box 402  
Mineral, Virginia 23117**

February 3, 2010

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555-0001

Serial No.: 09-778  
NAPS: MES  
Docket No.: 50-338  
50-339  
License No.: NPF-4  
NPF-7

Pursuant to 10CFR50.73, Virginia Electric and Power Company hereby submits the following Licensee Event Report applicable to North Anna Power Station Units 1 & 2.

Report No. 50-338/2009-004-00

This report has been reviewed by the Facility Safety Review Committee and will be forwarded to the Management Safety Review Committee for its review.

Sincerely,



N. Larry Lane  
Site Vice President  
North Anna Power Station

Enclosure

Commitments contained in this letter: None

cc: United States Nuclear Regulatory Commission  
Region II  
Sam Nunn Atlanta Federal Center  
61 Forsyth Street, SW, Suite 23T85  
Atlanta, Georgia 30303-8931

NRC Senior Resident Inspector  
North Anna Power Station

IE22  
NRR

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [infocollect@nrc.gov](mailto:infocollect@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

**1. FACILITY NAME**

NORTH ANNA POWER STATION, UNIT 1

**2. DOCKET NUMBER**

05000338

**3. PAGE**

1 OF 6

**4. TITLE**

AUTOMATIC REACTOR TRIP AND ESF ACTUATION DUE TO HUMAN PERFORMANCE ERROR DURING TESTING

**5. EVENT DATE**

MONTH	DAY	YEAR
12	09	2009

**6. LER NUMBER**

YEAR	SEQUENTIAL NUMBER	REV NO.
2009	-- 004 --	00

**7. REPORT DATE**

MONTH	DAY	YEAR
02	03	2010

**8. OTHER FACILITIES INVOLVED**

FACILITY NAME	DOCUMENT NUMBER
North Anna Unit 2	05000339
FACILITY NAME	DOCUMENT NUMBER
	05000

**9. OPERATING MODE**

1

**11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)**

- |   |   |  |  |
|---|---|--|--|
| <input type="checkbox"/> 20.2201(b)         | <input type="checkbox"/> 20.2203(a)(3)(i)   | <input type="checkbox"/> 50.73(a)(2)(i)(C)             | <input type="checkbox"/> 50.73(a)(2)(vii)    |
| <input type="checkbox"/> 20.2201(d)         | <input type="checkbox"/> 20.2203(a)(3)(ii)  | <input type="checkbox"/> 50.73(a)(2)(ii)(A)            | <input type="checkbox"/> 50.73(a)(2)(vii)(A) |
| <input type="checkbox"/> 20.2203(a)(1)      | <input type="checkbox"/> 20.2203(a)(4)      | <input type="checkbox"/> 50.73(a)(2)(ii)(B)            | <input type="checkbox"/> 50.73(a)(2)(vii)(B) |
| <input type="checkbox"/> 20.2203(a)(2)(i)   | <input type="checkbox"/> 50.36(c)(1)(i)(A)  | <input type="checkbox"/> 50.73(a)(2)(iii)              | <input type="checkbox"/> 50.73(a)(2)(ix)(A)  |
| <input type="checkbox"/> 20.2203(a)(2)(ii)  | <input type="checkbox"/> 50.36(c)(1)(ii)(A) | <input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 50.73(a)(2)(x)      |
| <input type="checkbox"/> 20.2203(a)(2)(iii) | <input type="checkbox"/> 50.36(c)(2)        | <input type="checkbox"/> 50.73(a)(2)(v)(A)             | <input type="checkbox"/> 73.71(a)(4)         |
| <input type="checkbox"/> 20.2203(a)(2)(iv)  | <input type="checkbox"/> 50.46(a)(3)(ii)    | <input type="checkbox"/> 50.73(a)(2)(v)(B)             | <input type="checkbox"/> 73.71(a)(5)         |
| <input type="checkbox"/> 20.2203(a)(2)(v)   | <input type="checkbox"/> 50.73(a)(2)(i)(A)  | <input type="checkbox"/> 50.73(a)(2)(v)(C)             | <input type="checkbox"/> OTHER               |
| <input type="checkbox"/> 20.2203(a)(2)(vi)  | <input type="checkbox"/> 50.73(a)(2)(i)(B)  | <input type="checkbox"/> 50.73(a)(2)(v)(D)             | <input type="checkbox"/> VOLUNTARY LER       |

**10. POWER LEVEL**

100%

**12. LICENSEE CONTACT FOR THIS LER**

FACILITY NAME

E. S. Hendrixson, Director Station Safety and Licensing

TELEPHONE NUMBER (Include Area Code)

(540) 894-2108

**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

**14. SUPPLEMENTAL REPORT EXPECTED**☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO**15. EXPECTED SUBMISSION DATE**

MONTH	DAY	YEAR

**ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)**

At 1423 hours on 12/9/09, electrical supply breaker L102 was inadvertently opened, which caused the "C" Reserve Station Service Transformer (RSST) to de-energize. This caused a loss of power to the 1H and 2J Emergency Buses and an automatic start of the 1H and 2J Emergency Diesel Generators (EDGs); both EDGs operated as designed.

The Unit 1 "B" and Unit 2 "A" Charging pumps automatically started, as designed, due to the loss of power.

The Unit 2 "G" Bus did not automatically transfer from the "C" RSST to the "B" RSST prior to undervoltage relay lockout operation resulting in the loss of the Unit 2 Circulating Water pumps. This resulted in a loss of condenser vacuum and a subsequent Unit 2 turbine and reactor trip. The Unit 2 Auxiliary Feedwater (AFW) pumps automatically started and operated as designed. The Unit 2 "C" Station Service Bus was also de-energized following the trip, as expected with the "C" RSST de-energized. This resulted in the loss of the Unit 2 "C" Reactor Coolant Pump (RCP). The "A" and "B" RCPs operated as designed.

This event is reportable per 10 CFR 50.73 (a)(2)(iv)(A) for the automatic actuation of the Reactor Protection System, EDGs, AFW System, and Charging Systems. No significant safety consequences resulted from this event since all Engineered Safety Feature equipment responded as designed. Therefore, the health and safety of the public were not affected by this event.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME  NORTH ANNA POWER STATION UNIT 1	2. DOCKET  05000 - 338	6. LER NUMBER			3. PAGE  2 OF 6
		YEAR  2009	SEQUENTIAL NUMBER  --004 --	REV NO.  00	

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

**1.0 DESCRIPTION OF THE EVENT**

At 1423 hours on December 9, 2009, Unit 1 was operating in Mode 1 at 100% power and Unit 2 was operating in Mode 1 at approximately 97% power when an Engineered Safety Features (ESF) actuation occurred on both Units, followed by a Unit 2 automatic reactor trip. A low vacuum in the condenser initiated a turbine trip and subsequent reactor trip. Unit 2 immediately entered 2-E-0, "Reactor Trip or Safety Injection," and then transitioned to 2-ES-0.1, "Reactor Trip Response," approximately 5 minutes later. All ESFs functioned as designed.

A Dominion employee was performing functional testing of protective relay circuitry related to Switchyard breaker H602 (EIIS System – FK, Component – BKR) when Switchyard breaker L102 was inadvertently opened. Breaker L102 is the supply breaker to electrical bus 3 (EIIS System – EA, Component – BUS), which in turn supplies the "C" Reserve Station Service Transformer (RSST) (EIIS Component – XFMR). These components de-energized, causing the loss of "F" Transfer Bus (EIIS Component – BUS), which resulted in a loss of power to the 1H and 2J Emergency Buses (EIIS System – EB, Component – BUS). This initiated an automatic start of the 1H and 2J Emergency Diesel Generators (EDGs) (EIIS System – EK, Component – DG). Both EDGs started and loaded their respective emergency bus as designed.

The Unit 1 "B" and Unit 2 "A" Charging pumps and the Unit 1 "B" and Unit 2 "A" Component Cooling Water pumps also automatically started, as designed, due to a low voltage signal on the 1H and 2J Emergency Buses.

The loss of the "C" RSST de-energized the Unit 2 "G" Bus (EIIS System – EA, Component – BUS), which supplies power to the Unit 2 Circulating Water (CW) pumps (EIIS System – KE, Component – P). Fast Transfer relays (EIIS Component – RLY) are in place that can automatically transfer the Unit 2 CW pumps loads from the "C" RSST to the "B" RSST. However, the Fast Transfer breaker did not close prior to the Unit 2 "G" Bus undervoltage (UV) relay lockout operation, resulting in the tripping the Unit 2 CW pumps. The loss of these pumps resulted in a loss of condenser vacuum with subsequent automatic turbine and reactor trips. The Unit 2 Auxiliary Feedwater (AFW) pumps automatically started and provided flow to the steam generators as designed.

The Unit 2 "C" Station Service Bus was also lost following the trip. With "C" RSST de-energized, the "C" Station Service Bus was unable to remain energized due to the unavailability of its auxiliary source ("C" RSST). This resulted in the loss of the Unit 2 "C" Reactor Coolant Pump (RCP). The "A" and "B" RCPs remained in service throughout the event and provided heat removal capabilities as designed.

The Root Cause Evaluation (RCE) found that the test method used to calibrate the Unit 2 "G" UV lockout timers (EIIS System – KE, Component – TMR) had introduced a 50-55 ms bias on a setpoint of 200 ms, resulting in a shorter lockout time. This bias was sufficient to

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME  NORTH ANNA POWER STATION UNIT 1	2. DOCKET  05000 - 338	6. LER NUMBER <table border="1"> <tr> <td data-bbox="1050 223 1156 327">YEAR  2009</td> <td data-bbox="1156 223 1301 327">SEQUENTIAL NUMBER  --004 --</td> <td data-bbox="1301 223 1422 327">REV. NO.  00</td> </tr> </table>	YEAR  2009	SEQUENTIAL NUMBER  --004 --	REV. NO.  00	3. PAGE  3 OF 6
YEAR  2009	SEQUENTIAL NUMBER  --004 --	REV. NO.  00				

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

prevent the circuitry from actuating in accordance with its design. Corrective actions associated with this discovery are being dispositioned under North Anna RCE000995.

This event is reportable per 10 CFR 50.73 (a)(2)(iv)(A) for the automatic actuation of the Reactor Protection System, EDGs, the AFW System, and the Charging System. No significant safety consequences resulted from this event since all Engineered Safety Feature equipment responded as designed. Therefore, the health and safety of the public were not affected by this event.

A four-hour and eight-hour report was made to the NRC on December 9, 2009 at 1715 hours, due to a Reactor Protection System actuation in accordance with 10 CFR 50.72 (b)(2)(iv)(B) and an Engineered Safety Function (EDG, AFW, and Charging System) actuation in accordance with 10 CFR 50.72 (b)(3)(iv)(A).

## 2.0 **SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS**

This event posed no significant safety implications since all Engineered Safety Feature equipment responded as designed.

This event is reportable pursuant to 10 CFR 50.73 (a)(2)(iv)(A) for the automatic actuation of the Reactor Protection System, Emergency Diesel Generators, Auxiliary Feedwater System, and Charging System.

## 3.0 **CAUSE**

The direct cause of this event was determined to be a Human Performance error during relay functional testing in the North Anna Switchyard. The root cause was Inadequate Communication between Dominion Nuclear business unit employees and Dominion Transmission employees.

A contributing cause to this event was a latent error in the timing sequence of the "G" bus Fast Transfer scheme caused by inadequate procedural guidance for timer calibration testing. Had the Unit 2 "G" Bus UV lockout timers been calibrated as designed, the Unit 2 reactor trip could have been avoided.

### **Circumstances associated with this event include:**

Personnel: The personnel performing this evolution were Dominion Transmission employees assigned to North Anna and were working on Transmission assets. They regularly perform work on both Nuclear assets and Transmission assets. The requirements and expectations associated with work on these respective types of assets vary, as delineated in the associated administrative procedures and agreements.

These differences include requirements for detailed procedure steps, increased

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME  NORTH ANNA POWER STATION UNIT 1	2. DOCKET  05000 - 338	6. LER NUMBER			3. PAGE  4 OF 6
		YEAR  2009	SEQUENTIAL NUMBER  --004 --	REV NO.  00	

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

verifications, and clear communications that are more rigorous for Nuclear work than Transmission work. Had Nuclear-level procedures, work practices, communication, job planning, and oversight been utilized, this event would likely have been precluded.

Work Activity: Post-event interviews with the personnel involved indicated that no time or situational pressures adversely impacted their performance.

**Causes associated with this event include:**

Procedures: Several permissible calibration methods exist for the testing of UV timers. Information obtained after the event indicated different methods can produce deltas between "indicated" and "actual" results. This results in variations in the as-left settings (e.g. lower settings, which may not be in the acceptable band). Timer calibration methods are not specified in the Electric Transmission Relay Technician training program or in relay testing procedures, resulting in different methods being utilized in the field at the discretion of the technicians. The test method used during the last calibration resulted in a 50-55ms bias on a 200 ms setpoint, resulting in a shorter lockout time.

Had the procedure specified a more accurate method for calibrating the timers, the CW pumps' power supply could have transferred successfully and the Unit 2 reactor trip could have been avoided.

Training: Lockout blade manipulation methods were not specific in Electric Transmission Relay technician training, which resulted in the utilization of different practices in the field. Some methods used to manipulate lockout blades are less likely to impact adjacent lockout blades and have now been adopted as a Transmission standard.

Communications: Control Operations and Substation Switchyard procedures require an Operations notification at specific times, but do not require a face-to-face interaction, or specify the content and detail of that communication.

Human-System Interface: The physical labeling of the lockout blades contributed to the technician manipulating the L102 lockout blade for the purpose of verifying components. The present labeling tags cannot be readily viewed when the lockout blade is in the open position. The technician unnecessarily partially operated the lockout blade for L102 when verifying the label for H602.

Supervision and Oversight: Inconsistent or lack of supervisory oversight, both in the field and during Pre-Job Briefings, resulted in a failure to reinforce expectations for work practices and for the use of HU Event Free Tools.

Fitness for Duty: No Fitness for Duty concerns were associated with this event.

Work Practices: The technician manipulating the lockout blade was working independently,

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME  NORTH ANNA POWER STATION UNIT 1	2. DOCKET  05000 - 338	6. LER NUMBER			3. PAGE  5 OF 6
		YEAR  2009	SEQUENTIAL NUMBER  --004 --	REV NO.  00	

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

and did not follow the Nuclear standard or the Electric Transmission expectation of technicians working in pairs when manipulating devices. The technician also failed to adequately self-check that all adjacent lockout blades were in a safe, fully open position.

**4.0 IMMEDIATE CORRECTIVE ACTION(S)**

Control Room personnel responded to the trip in accordance with Emergency Operating Procedure 2-E-0, Reactor Trip or Safety Injection. The crew progressed through 2-E-0 and transitioned to 2-ES-0.1, Reactor Trip Response, approximately 5 minutes later.

Interim actions were implemented at NAPS immediately following the inadvertent opening of breaker L102, until the Root Cause Evaluation could be completed. The interim actions require detailed briefings of work to be performed in the Switchyard and Station with independent observations of certain "hands on" tasks, performing additional risk assessments for Switchyard work, and requiring supervisory oversight for certain risk-significant tasks.

**5.0 ADDITIONAL CORRECTIVE ACTIONS**

Supervisory Oversight, Verification Practices, Configuration Control, and Human Performance fundamentals will be reinforced. Calibration methods for timing relays will be examined so that specific methods may be required or disallowed for certain circuits.

An extent of condition review was performed to ensure no other Station timers were susceptible to failure due to the use of improper calibration methods and/or equipment.

**6.0 ACTIONS TO PREVENT RECURRENCE**

Review procedures for possible revision to clarify the interface between the two Dominion business units.

**7.0 SIMILAR EVENTS**

LER 2000-002-00 On April 4, 2000, at 1146 hours, with Unit 2 in Mode 1 operating at approximately 7% power, a manual reactor trip was initiated to comply with Technical Specification 3.4.1.1 due to the loss of the "C" reactor coolant pump RCP. While preparing to install the potential transformer fuses for recovery of the 2C Station Service Bus (SSB), the drawer for the "F" emergency transfer bus was opened. This caused the "C" Reserve Station Service Transformer (RSST) to unload, de-energizing the 1H and 2J emergency busses and also both Units' "C" SSBs. The "C" RCPs on both units tripped due to the loss of the "C" SSBs.

LER 98-006-00 Unit 1 was de-fueled for a scheduled refueling outage. An ESF actuation occurred during time response testing of SSPS slave relays when installation of the output

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME  NORTH ANNA POWER STATION UNIT 1	2. DOCKET  05000 - 338	6. LER NUMBER			3. PAGE  6 OF 6
		YEAR  2009	SEQUENTIAL NUMBER  --004 --	REV NO.  00	

**NARRATIVE** (If more space is required, use additional copies of NRC Form 366A) (17)

fuses was performed out of sequence. This resulted in actuation of certain ESF equipment since the steps to disable or block their functions had not yet been performed.

**8.0 ADDITIONAL INFORMATION**

Unit 1 was operating in Mode 1 at 100% power at the time of this event and remained at approximately 100% power for the duration of the event. The Unit 1 "H" EDG and "B" Charging pump auto-started as designed due to the loss of power to the 1H Emergency Bus.